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Temporally Restricted Composition

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I develop and defend a novel answer to Peter van Inwagen's 'Special Composition Question,' (SCQ) namely, under what conditions do some things compose and object? My answer is that things will compose an object when and only when they exist simultaneously relative to a reference frame (I call this 'Temporally Restricted Composition' or TREC). I then show how this view wards off objections given to 'Unrestricted Mereology' (UM). TREC, unlike other theories of Restricted Composition, does not fall prey to worries about vagueness, anthropocentrism, or arbitrariness. TREC also has advantages over all the other answers to the SCQ. TREC is an account an A-theorist anti-Eternalist who wants an unrestricted mereology should accept. I also engage in some conceptual hygiene by showing how UM, as it should be used, should not, in itself, entail or contain a commitment to either Eternalism or Four-Dimensionalism.

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Peter Van Inwagen's 'Special Composition Question' ('SCQ') asks—when do some things compose or make up a further thing? (Van Inwagen 1990: 21–33). The Unrestricted Mereologist answers—'always'. (see Rea 2008 and Sider 2001) Some rivals of UM, the Nihilists, answer: 'never' (e.g. Rosen and Dorr 2002, Dorr 2005). Organicists say composition occurs 'when the things compose an organism'. (Van Inwagen 1990, Merricks 2003) According to the folk theory we could call 'Intuitivism' the answer is that composition occurs 'whenever we intuitively think it does'.¹ Lastly, the Brutalist answers that composition's obtaining or not is brute and unexplainable (Markosian 1998).

There are serious problems with all of these accounts. No one, to my knowledge, has proposed the answer that I will recommend.² I will

¹ This view is tacitly assumed by many, e.g. Wiggins 1980.

² There is however, brief discussion of one of the embedded conditionals in Hudson 2001. As this is nearing publication, I just noticed the paper by McKenzie

argue that the correct answer to the SCQ is what I will call ‘Temporally Restricted Composition’, or ‘TREC’ for short. Stated informally it is as follows:

(TREC) For any X’s they will compose a fusion F at a time t when and only when all of their parts exist simultaneously, relative to a reference frame.³

Stated informally without regard to Relativity Theory, we have:

(TREC*) For any X’s they will compose a fusion F when and only when the X’s exist simultaneously.

I will argue that TREC is a better answer to the SCQ than the rival positions. TREC acknowledges all the composite objects of common-sense, respects many of the persuasive arguments which support unrestricted mereology, without incurring ontological commitment to a profusion of cross-time fusions. TREC is a non-*ad hoc* answer to SCQ which avoids arbitrariness and anthropocentrism, while also avoiding problems of vagueness.

I will suppose that the fundamental objects/things over which the SCQ ranges are either fundamental or simple particles (if there are any) or ‘atomless gunk’ portions (if there are any). Events, if there are any, would I believe have a different mereological structure than objects, and when people talk of objects they are not talking of baseball games or recessions. At least, this seems presumed in the literature on composition, which has sidestepped events (with the exception of 4d, which one could construe as consolidating the categories of *object* and *event*). Certainly the literature is largely restricting the discussion with SCQ to objects, most likely to its detriment. And it also seems that TREC is decidedly *not* true of events, such as baseball games which are composed of nine non-simultaneous innings. So, none of what I say about objects will necessarily hold of events.

TREC is inconsistent with Four Dimensionalist accounts which accept that there are wholes composed of temporally disjoint parts. TREC is only consistent with Three-Dimensionalism, which is the doctrine that objects persist through time by being ‘wholly present’ at different times, rather than by having distinct temporal parts at different times.⁴ One of my targets is Unrestricted Mereology, but this is not equivalent

and Muller 2017, which has some similarities, but based on state boundedness rather than simultaneity.

³ Slightly more formally, $\forall t \forall F \forall X: (\exists y: X \text{Cyt} \iff X \text{Et} F)$, or, for all time’s t, frames of reference F, and any X’s, there will exist a y such that the X’s compose y at t if and only if the X’s Exist-at-t-relative to F. Thanks to two anonymous referees for some helpful comments on TREC.

⁴ TREC does not strictly speaking entail Three-Dimensionalism, since it is consistent with the claim that simples never last more than an instant, according to any reference frame. TREC is only Three-Dimensionalist along with this supposition, which is a way of assuming Three Dimensionalism. I will suppose that simples can, and often do, endure.

to Four-Dimensionalism. Unrestricted Mereology entails that temporal parts compose cross-time fusions only if temporal parts exist. One could furthermore be a Four-Dimensionalist who has a restriction on which temporal parts fuse. I will just assume Three-Dimensionalism, and show how TREC gels with a Three-Dimensionalistic picture.

Intuitively, we want there to be a restriction on composition, otherwise we will have strange objects, composed, for instance, of Alexander the Great's kidney and Tom Cruise's gall bladder, and another composed of all the salmon and Obama's great-great grandchildren. But, the main arguments against a restriction on composition is that any proposed restriction will be either (i) arbitrary or *ad hoc*, (ii) anthropocentric, or (iii) will entail worldly vagueness about what exists (Sider 2001: 11–74). I will show that TREC succumbs to none of these objections. Then I will show what benefits TREC has, compared to its rivals.

TREC is not arbitrary. Simultaneity according to a reference frame is a significant natural property, which arguably must obtain for any causal relations to obtain.⁵ It is not picked out of the blue to obtain certain desired results. It is a non-Presentist acknowledgment of simultaneity as crucial in one's consideration for objects to 'get together' to make up a further object. Objects which are not on the same hyperplane, and are outside of each other's future and past light cones can have no causal interactions. It is intuitive that a composite object's parts can exert some causal influence on each other, and act jointly (in such a way, for instance, that they can have a center of gravity, which cross-time fusions cannot). Supposed fusions which can do none of these things seem to lack what it takes to compose an object. However, objects which do exist simultaneously according to a reference frame, such as all those which compose our galaxy, *can* have causal interactions, such as mutual gravitational pull, shared spin-relations along an axis or center of gravity, and so on.

Three-Dimensionalists should be suspicious of cross-time fusions. Assume that there is a world W with absolute time, and suppose that x exists at t1 only, at y at t3 only. The unrestricted mereologist would hold that x and y compose a fusion F. But the Three-Dimensionalist, especially of the A-theorist variety, should doubt this. When does F exist? Not at t2. An object can't exist at a time when none of its parts do. At t1? How could *it* (the fusion of x and y) exist at t1? Only part of it exists then. Y is not even in existence yet, so how could it compose something? At t3? How could it be? One of its parts, x, no longer exists? I do not take this as conclusive, and to solidify this point would take us far afield of the goals of this article. I merely want to point out

⁵ Quantum entanglement phenomena does not cut against this, as entangled particles needed to exist simultaneously at some time according to a reference frame in order to be entangled, even if the effects of this entanglement could manifest after the particles are no longer simultaneous according to any reference frame. C.f. McKenzie and Muller 2017.

how the Three-Dimensionalist Non-Presentist⁶, who already believes in some kind of temporally relativized notion of property-possession (such as shapes, which are often held to be disguised relations to times by Three-Dimensionalists), has ample reason to believe that parthood is temporally relative and has a synchronous requisite as well, if the 'present' in 'wholly present' is to have any meaning. TREC does not itself entail mereological essentialism (ME), or the doctrine that objects have all of their parts essentially, unless we assume that all objects are identical with mereological sums, which is questionable. (More on this below). But TREC it is consistent with ME, and can be combined with standard mereological theses such as uniqueness and extensionality which will entail ME. I do think that ME is correct, and while TREC helps make sense of and defend it, the truth of TREC does not depend on it.⁷

TREC is not anthropocentric. Even those who believe that time does not 'really' exist, or believe that the flow of time is illusory, still accept, if they accept Relativity Theory, that simultaneity according to a reference frame, light-cone charts, and Minkowski spacetime diagrams, all capture important natural joints in the world which are neither psychological nor merely conventional.

While some still believe that reference frames are necessarily defined in terms of an observer, most do not, and can define a reference frame in terms of a coordinate system. Most believe that Relativity phenomenon still occur where no observers are, or could be. If this is so, then TREC does not succumb to the anthropocentricism charge on this score, either.

TREC does not entail worldly vagueness. One of the strongest arguments against restrictions on composition has been given by Ted Sider (2001 chapter 4.9), and now goes by the name of 'the argument from vagueness,' which is used to support Four Dimensionalism. Briefly, and superficially (the argument is quite complicated), the problem, supposedly, with any restriction on composition short of Nihilism (the doctrine that composition never occurs) is that the restriction will inevitably be vague, so that it is indeterminate what fusions there are, and hence indeterminate how many things exist, which is impossible.

Take any restriction you like (e.g., falling under a commonsense sortal, being chemically bonded, composing a life, etc.). Sider states that for any candidate restriction R captured by conditions C we can create a sorites-like series of cases starting from C determinately holding to a situation where it is indeterminate whether C obtains, and hence whether the fusion in question exists, and hence whether an object exists, which is impossible (Sider 2001 Ch. 4.9).

⁶ I take it that Presentism is not compatible with Relativity Theory, and hence a Presentist can't accept TREC*, which denies objective simultaneity. Although, see Zimmerman 2011 about how Presentism and RT could be reconciled.

⁷ See Steen (2016) for a defense of mereological essentialism.

TREC does not succumb to this objection if synchrony is not conventional. While this issue is somewhat controversial, it is held by many that Malament's Theorem proves the non-conventionality of simultaneity according to a reference frame. Torretti says,

Malament proved that simultaneity by standard synchronism in an inertial frame F is the *only* non-universal equivalence between events at different points of F that is definable ("in any sense of 'definable' no matter how weak") in terms of causal connectibility alone, for a given F . (Torretti 1983: 229)

So, if synchrony is objective, then the argument from vagueness has no bite against the TREC theorist. There is no sorites-series of time indexed states of affairs $S_1 \dots S_n$, where, according to S_1 , it is determinate that composition holds in S_1 , and indeterminate whether composition holds for some first S_{1+n} . For any two objects O_1 and O_2 , and for any arbitrarily chosen reference frame R , either O_1 and O_2 exist simultaneously according to R or not. If there is no R such that O_1 and O_2 exist simultaneously according to it, then there will be no fusion of them whatsoever.

If one objects that a fusion F composed out of O_1 and O_2 will exist according to a frame R_1 , and not according to R_2 , and hence it is indeterminate whether F exists, then one is not thoroughly accepting Relativity Theory. One would be, against Relativity Theory, privileging one frame over another, or, incoherently, attempting to combine a timeless notion of parthood with the TREC view that parthood is relative to times (which are in turn relative to reference frames). In fact, according to TREC, parthood is a four-place relation. There is no parthood simpliciter. O_1 cannot simply be a part of O_2 . O_1 can only be a part of O_2 if O_1 is a part of O_2 at time t , relative to R .

It might be thought strange that there is no frame-independent answer to how many things there are, but this amounts to no more than an incredulous stare. There are also no frame-independent answers to how long something is, when something occurred, how much time passed, and so on. There are also no frame-independent temporal orderings of a sequence of events. E_1 can occur before E_2 according to R_1 , whereas E_2 can occur simultaneous with E_1 according to R_2 . If one accepts Relativity Theory already, with its concomitant strangeness, then the relativity of which composites there are is par for the course.

Lastly, some parting words on why TREC is superior to its rivals. TREC has all of the strengths of UM, but lessens the bite of its main weakness. UM is supported by arguing against arbitrariness, anthropocentrism, and vagueness in composition. TREC endorses all of these arguments, and obeys the same strictures, without entailing a bevy of cross-time fusions which can exist even when some or none of their parts do (or exist eternally as parts of one thing, even when there is no time at which it exists). TREC also blocks the argument from vagueness, and gels with Three-Dimensionalism, which has support

independent of worries about composition. (There will be more on the objection of how the motivation for TREC really serves as a motivation for UM below).

TREC is superior to 'Organicism', or the view that the only composites are living beings. This is a severely limited view on what composites there are. TREC allows for living beings, as well as buildings, tables, and rocks. Organicism can be viewed also as 'inanimate composite object nihilism,' and has severe weaknesses in that 'causal-redundancy' and compositional scepticism premises command less credence than the proposition they entail the falsity of, namely that there are composite non-living objects. Organicism also has the unwelcome consequence of either positing a sharp-line between the living and the non-living, which doesn't seem to exist in nature, or supporting that there are some vague objects (namely, objects of which it is indeterminate whether they are living, and hence indeterminate whether there are certain sums).

TREC is superior to Nihilism, or the view that there are no composite entities whatsoever. TREC allows composite objects, which is obviously an intuitive desiderata, and is untouched by one of the major concerns that motivate Nihilism, namely, concerns about vagueness. Also, the Nihilist who rejects extended simples cannot hold that there is 'gunk', or stuff whose proper parts all have proper parts, *ad infinitum*. There can be no gunk, according to the Nihilist who rejects extended simples, since gunk is composite, and the gunk hypothesis rules out point particles.⁸ TREC has no such entailments, and does not rule out gunk worlds.

TREC is superior to 'Brutal Composition,' or the view that whether or not composition occurs is just a brute fact with no explanation whatsoever (Markosian 1998). Any well-supported explanation is better than none, and TREC gives one. Furthermore, this explanation goes along with commonsense more than Brutalism, in that Brutalism leaves it mysterious whether there are ordinary composite objects, and also allows, in principle (since there is no principle disallowing it) that there are bizarre cross-time fusions. The Brutalist rules out Four-Dimensionalism via the argument from vagueness only by positing a brute restriction which, for all we know, rules out all the composite Three Dimensional objects the Brutalist was attempting to rescue.

TREC is also superior to the often held, but almost never stated view of composition which we could call 'Intuitivism'. Intuitivism is the view that composition occurs whenever we intuitively think it does. Intuitivism is also the view held by those who think worrying about the Special Composition Question is silly. Such people, rather than thinking there is no answer to the SCQ, often believe that there are some

⁸ And, the acceptance of extended simples brings along it's own problems. Furthermore, the supposition of there being stuff which is not things which composes simples goes against the desired sparseness of the Nihilists view. For work on extended simples, see Markosian 1998a and 2004.

composites (such as themselves, or baseballs) but not others (such as the object composed of the Pyramids of Giza and the Bee Gees), but either think that there is no principle whatsoever, or the unsatisfactory Intuitivist one. This 'view', if it can be called one, also succumbs to the charges of arbitrariness, anthropocentricity, and vagueness. One cannot escape the SCQ by refusing to think about it, since, by default, one will accept this unacceptable folk view about composition. One might attempt to rescue Intuitivism by becoming Aristotelian or neo-Aristotelian, and hold that simples compose a sum S just in case there is an Aristotelian form F (or substantial form, or rigid embodiment, or dominant sortal, etc. etc.)⁹ which inheres in the simples. But, if one does this, one just reintroduces the worries about anthropocentricity and vagueness. Which candidate F's are actually forms? Can one rule out bizarre substantial forms (or whatever substitute you like) and give an answer to the SCQ without being slavish to our contingently possessed perceptual and cognitive faculties, and interests? Can one hold a view like this and rule out vagueness? I hold, with Sider (2001) and Kurtstal Steen (2010), that the answer is 'no'.

A final worry about TREC is that, while it does rule out all cross-time fusions, that it does allow in many strange ones not countenanced by the folk, such as the sum of the paper you are reading and your pinky. But, I think the argument from vagueness, while not showing that *any* restriction is nonviable (for I believe of course that TREC is a viable restriction), does in fact show that every other presented alternative to Unrestricted Mereology and TREC is nonviable. While there may be other restrictions which are neither arbitrary, anthropocentric, or entail worldly vagueness, I have not seen any. Kurtstal Steen (2010) does a good job of showing how, despite appearances, the argument from vagueness does not in fact entail four-dimensionalism. So, my employment of it in arguing against other views and for TREC does not commit me to four-dimensionalism either.

But one might think that the TREC is not sufficiently motivated since vagueness, arbitrariness, and anthropocentricity concerns support UM. TREC still allows in a bevy of odd objects, and faces the same objections that UM does. So why not 'go all the way' for wholesale UM?

There are several reasons not to. One should ask the following—Does UM entail Eternalism (the doctrine that all times, past present and future are all equally real, there being no privileged 'now')? If so, then all those reasons to reject Eternalism (e.g. free will issues, the problem of change, counterintuitiveness, no time flow, etc. etc.) apply to UM. If not, then UM may in fact be consistent with TREC (e.g., if Presentism were true, a UM and TREC would entail the existence of a coextensive sets of fusions).

But, if one looks at the literature, and how UM is understood, its proponents do in fact seem to believe that UM entails Eternalism or

⁹ See, for example, Burke 1994, Fine 1999, and Koslicki 2008.

has Eternalism as a part of the doctrine.¹⁰ But, as I think I have shown, one can think that whatever exists has a fusion and yet reject UM, and so there is a major distinction between UM'ists and TRECKies. TREC is like unrestricted mereology for A-theorists. To the extent that one accepts A-theory and the arguments for restricted composition based on the worries of arbitrariness etc. then one should accept TREC.

There are other arguments one could give for TREC over UM, such as some of the table-pounding one given on page 3. One might also say that UM falls prey to 'double-counting' in a way that TREC does not. Suppose that there are a collection of simples spread around the galaxy at t_1 —call it S1. Now suppose, as a three-dimensionalist would say, that the very same collection of simples endures (no parts go out of existence) and is identical with a collection S2 at t_2 . This seems innocent (to me). The TRECKie would say that S2 is S1 and we have one entity. The UM'ist would say that S2 and S1, being distinct entities, would compose a fusion S3, which exists atemporally. But this strikes me as double-counting.

Or would they accept S3 as a distinct entity? Well, this depends—does UM entail Four-Dimensionalism, or have Four-Dimensionalism as a part of the doctrine? If it does, then those who do not accept Eternalism and Temporal Parts would have reason to reject it, and would need to posit some other principle, similar to UM, which does not entail these views. (And what would be if not TREC?). If it does not entail 4d, then it seems that UM is actually consistent with TREC. But, the way the phrase is used, it does in fact seem that UM is a 'package deal', namely, unrestricted mereology + Eternalism + Four-dimensionalism (of the temporal parts variety).

All I have done is merely outline and argue for a modest proposal—namely, a more narrow theory of unrestricted composition for A-theorist Three-Dimensionalists who accept that restrictions on composition are hopeless. By pointing out that the phrase 'unrestricted mereology' or 'unrestricted composition' are misleading, I've teased apart several features that get run together and laid out how a Three-Dimensionalist A-theorist who is moved by the argument from vagueness should think about unrestricted composition. Hopefully that might clear up some problems in the debates about persistence and time. At the very least, I have laid out what a theory of unrestricted composition might look like if one accepts, say, the Moving Spotlight, or the Growing Block views of time.¹¹

¹⁰ See, e.g. Rea's definition (1998: 348), Sider (2001: 120), Koslicki (2008: 74). Overall this may be due to the famous dictum of Quine's where UM and temporal parts are uttered in one breath when he states that physical objects are just "the material content of any portion of space-time" (Quine 1976: 497).

¹¹ Thanks go to Sandy Berkovski, Andre Gallois, Mark Heller, Kris McDaniel, Thomas McKay, and Dean Zimmerman for some of the earliest feedback on some of this material, which goes all the way back to my dissertation (2005). I am also

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